

Crash testing of a Netti S - 22" rear wheels according to ISO 7176-19, section 5.2.

(4 appendices)

Summary

A crash test of a Netti S - 22" rear wheels wheelchair has been performed. The wheelchair was loaded with a small adult female 59 kg crash test dummy and crash tested at 48,4 km/h, with a 15 g pulse for > 40 ms and 20 g for > 15 ms duration.

Section	Reference	Comment	Fulfilment of requirement
5.2.1a	Horizontal excursion	OK	Yes
5.2.1b	Knee vs. WC excursion	5,28	Yes
5.2.1c	Battery movement		NA
5.2.2a	ATD torso angle < 45°	OK	Yes
5.2.2b	Securement points	OK	Yes
5.2.2c	Separation of < 100 grams	OK	Yes
5.2.2d	Sharp edges radius > 2 mm	OK	Yes
5.2.2e	Load carrying components	OK	Yes
5.2.2f	Tilt-in space locking	OK	Yes
5.2.2g	Removal of ATD, no tools	OK	Yes
5.2.2h	WC removal, no tools	OK	Yes
5.2.2i	Post height diff < 20 %	< 1 %	Yes
5.2.2j	No webbing failure	OK	Yes

The test object fulfilled the requirements in ISO 7176-19:2008, section 5.2.

RISE Research Institutes of Sweden AB

Postal address	Office location	Phone / Fax / E-mail
Box 857	Brinellgatan 4	+46 10 516 50 00
SE-501 15 BORÅS	SE-504 62 BORÅS	+46 33 13 55 02
Sweden		info@ri.se

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1. Introduction

RISE Research Institutes of Sweden AB has on assignment of Alu Rehab AS performed a crash test of a Netti S - 22" rear wheels wheelchair according to ISO 7176-19:2008. The purpose of the test was to evaluate if the wheelchair fulfilled the crash test requirements with a small adult female 59 kg crash test dummy.

2. Description of the test object

Manufacture:	Alu Rehab AS
Wheelchair name:	Netti S - 22" rear wheels
Wheelchair serial no:	115 - 001235
Seat width:	350 mm
Seat depth:	350 mm
Seat height:	460 mm
Wheel base:	Netti S
WC weight:	28,7 kg
Seat angle:	10° backwards
Back rest angle:	12°
Back rest type:	Netti S / Netti Dynamic S fixed
Back rest height:	380 mm seat plate - top of Velcro
Arm rest:	Netti S / Netti Dynamic S fixed
Leg rest/Foot plate:	Netti Mini Universal w foot board
Calf pads:	No
Heel straps:	Yes
Drive/Rear wheel:	22"
Wheel attachment:	QR
Castor wheel:	6"
Castor wheel fork:	For 6" wheels
Castor Stem:	Upside down QR
Headrest:	Netti Mini
Pelvic belt:	No
Antitip device:	Yes, Netti S turned upward
Occupant restraint system:	Unwin
4-point tie down system:	Unwin
Occupant weight range:	>57 to 75 kg
Test object arrival at RISE:	2019-09-27
Selection of test object:	The test object has been selected by the client without RISE's assistance.

3. Test method and performance

Test method:	ISO 7176-19:2008, section 5.2
Test date:	2019-10-17
Test facility:	RISE Safety - Mechanics Research crash laboratory in Borås.
Ambient temperature:	20,6 °C RISE inv. no: 403553
Crash pulse:	15 g for > 40 ms, 20 g for > 15 ms, 48-50 km/h.
Pulse measurement:	Two accelerometers mounted on the sled, the graph can be found in appendix 1. RISE inv. nos. BX42667 and BX42669.
Velocity measurement:	Optical time sensors measuring the time for the sled to travel a distance of 0,5 meters just before impact. RISE inv. no. 900081.
Excursion measurement:	The excursion values were measured from the high-speed film by the film analysis program, TEMA, with an accuracy of ±5 mm.
Film camera:	Photron Fastcam SA4, 1000 frames per second, with a TamronSP-AF/28-75mm-F/28 XR Di lens.
Crash test dummy:	Small adult female 59 kg.
Occupant restraint system and manufacture:	Unwin
4-point tie down system and manufacture:	Unwin
Photographs:	Photos were taken before and after the test and can be found in appendix 2.

The test object was mounted in a forward facing direction on the impact sled and attached with the 4-point tie-down restraint. A small adult female 59 kg crash test dummy, was positioned in the test object and fixed with the 3pt occupant restraint.



Photo 1. Test setup

4. Test results

The sled was accelerated to a speed of 48,4 km/h before impact.

Table 1 Test results

Standard section	Reference	Requirement	Result/ Comment	Requirement fulfilment
5.2.1a	Horizontal excursion: Head forward	< 550 mm	260 mm	Yes
5.2.1a	Horizontal excursion: Head rearward	< -400 mm	-384 mm	Yes
5.2.1a	Horizontal excursion: Knee forward	< 375 mm	132 mm	Yes
5.2.1a	Horizontal excursion: Wheelchair point forward	< 200 mm	25 mm	Yes
5.2.1b	Knee vs. WC excursion: X_{knee} / X_{wc}	> 1,1	5,28	Yes
5.2.1c	Batteries of powered wheelchairs shall: - not move completely outside the wheelchair footprint - not move into the wheelchair user's legs space		NA	NA
5.2.2a	The wheelchair shall remain in an upright position on the test platform. The ATD shall be retained in the wheelchair in a seated posture, as determined by the ATD torso being oriented at no more than 45° to the vertical.		OK	Yes
5.2.2b	The wheelchair securement points shall not show visible signs of material failure.		OK	Yes
5.2.2c	Components, fragments or accessories of the wheelchair with a mass in excess of 100 grams shall not have completely separated from the wheelchair.		OK	Yes
5.2.2d	Wheelchair components that may contact the occupant shall not fragment or separate in a manner that produces sharp edges, as defined by having a radius less than 2 mm.		OK	Yes
5.2.2e	Primary load carrying components of the wheelchair shall not show visible signs of failure.		OK	Yes
5.2.2f	Locking mechanisms of tilt-in-space seat adjusters shall not show signs of failure.		OK	Yes
5.2.2g	Removal of ATD from the wheelchair shall not require the use of tools.		OK	Yes

5.2.2h	Release of wheelchair from the tie-down system shall not require the use of tools.	OK	Yes
5.2.2i	The post-test height of the average of left and right ATD H-points relative to the wheelchair ground plane shall not have decreased by more than 20 % from the pre-test height.	< 1 %	Yes
5.2.2j	The wheelchair and its components shall not cause partial or complete failure of the webbing of any of the WTORS assemblies during the test.	OK	Yes

The test object fulfilled the requirements according to ISO 7176-19:2008, section 5.2. The test results showed in this report refer only to the tested object.

5. Measurement uncertainty

The measurement uncertainty for the deceleration pulse is less than 1,5 %.
Reported uncertainty corresponds to an approximate 95 % confidence interval around the measured value. The interval has been calculated in accordance with EA-4/16 (EA guidelines on the expression of uncertainty in quantitative testing), which is normally accomplished by quadratic addition of the actual standard uncertainties and multiplication of the resulting combined standard uncertainty by the coverage factor $k=2$.

RISE Research Institutes of Sweden AB Safety - Mechanics Research

Performed by

Examined by

Per Bodin

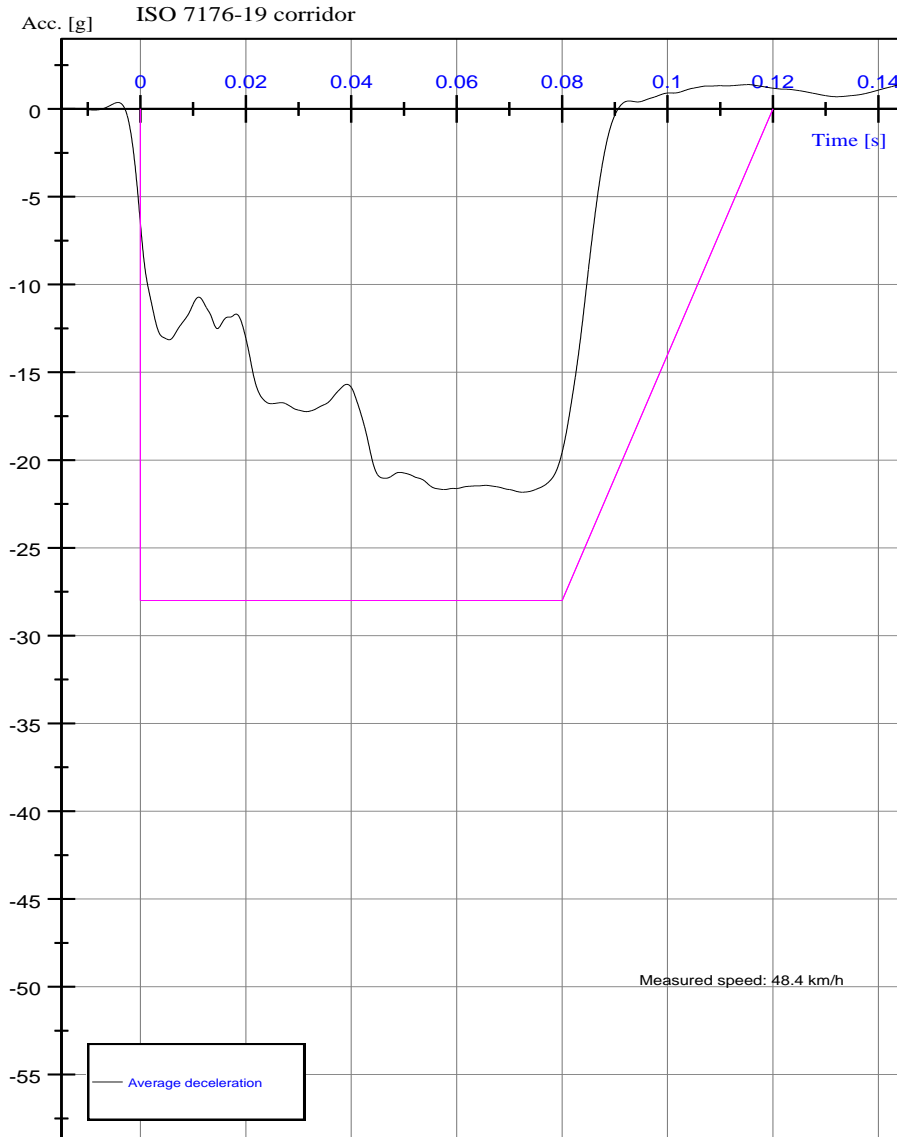
Magnus Andersson

Appendices

- Appendix 1: Deceleration graph (1 page)
- Appendix 2: Photos (4 pages)
- Appendix 3: Drawing Netti S 35cm no: 608525 dated 02-04-2019 (page 1)

Appendix 1

Sled deceleration, Average pulse, CFC 60

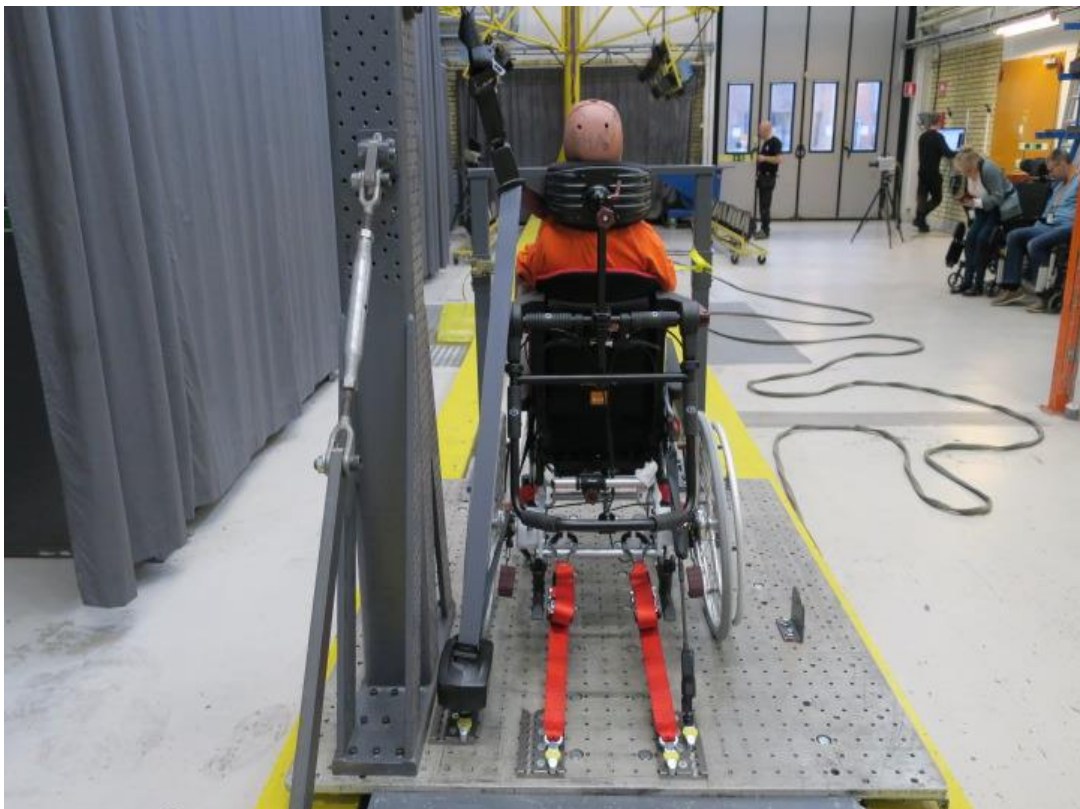


Customer:	Alu Rehab AS
Test object:	Netti S, Hybrid III, 59 kg
Standard:	ISO 7176-19
Test date:	2019-10-17
Test:	2

Appendix 2

**Photo 1. Before test****Photo 2. Before test**

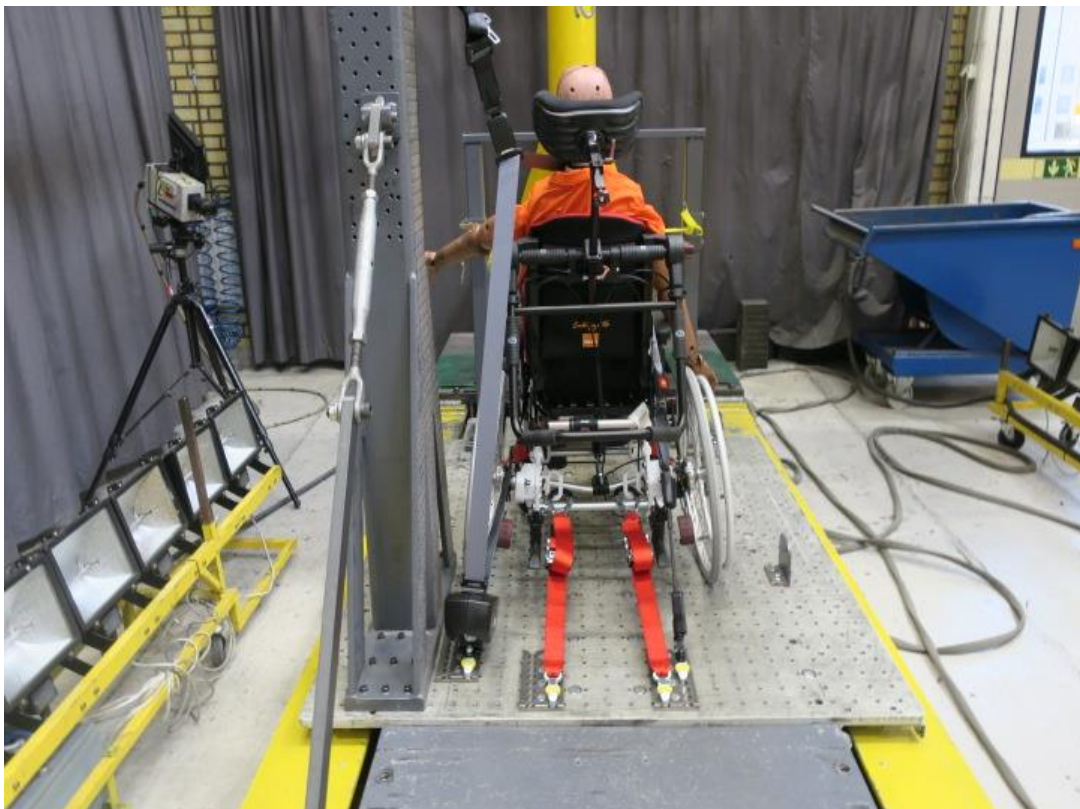
Appendix 2

**Photo 3. Before test****Photo 4. Before test**

Appendix 2

**Photo 5. After test****Photo 6. After test**

Appendix 2

**Photo 7. After test****Photo 8. After test**

Appendix 3

5	1	355303	355303	604330
4	1	Nett St. cushion 35 x 40 3D	355303	604422
3	1	Head support A, 3D, 350mm, Mini empl.	86133	606833
2	1	Footboard Mini empl.	80705	604417
1	1	Nett S, 35cm	90295	608612
Pos.	Qty.	Name	Item no.	Drawing
		Tolerance for non-tolerance ISO 2768-m		
		DO NOT SCALE DRAWING		
		APPROVALS		
		DATE	TITLE	
		02.04.2019	Nett S 35cm	
		SCALE	1:1	
		PROJECTION	FIRST ANGLE	
		GRAPHIC	90403	
		WEIGHT	47140,22 g	
		FINISH	608525	
		This drawing is Alu Rehab A.S property and should not be copied or delivered to other firms or agents without our permission.		

Chair width	Pos. 1	Fabric	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Item no.
25cm	90293	3D	80703	86133	187301	355301	90401
30cm	90294	3D	80704	86133	187302	355302	90402
35cm	90295	3D	80705	86133	187303	355303	90403
25cm	90293	Easy care	80703	89465	187301	355301	90404
30cm	90294	Easy care	80704	89465	187302	355302	90405
35cm	90295	Easy care	80705	89465	187303	355302	90406